PHOBOS AND DEIMOS AS SEEN BY HRSC ON MARS EXPRESS. K. Willner[1] and J.Oberst[1,2] and M. Wählisch[1] , [1]German Aerospace Center (DLR), Institute of Planetary Research, Rutherfordstr. 2, 12489 Berlin, Germany (konrad.willner@dlr.de), [2]Technische Universität Berlin, Institute of Geodesy and Geoinformation Science, Straße des 17. Juni 135, 10623 Berlin, Germany.

Introduction. ESA's Mars Express spacecraft began its mission in 2004. Thanks to its highly elliptical polar orbit that reaches beyond the orbit of Phobos (which moves about 6000 km above the Martian surface), the probe regularly engages in close encounters with this Martian satellite. The two onboard optical systems, the High Resolution Stereo Camera (HRSC)[1] and Super Resolution Channel (SRC)[2] observed the irregular-shaped satellite from varying distances and different viewpoints such that Phobos' surface is now almost completely covered by HRSC and SRC..

Observations and Studies. The SRC system is equipped with a 1k x 1k sensor [2] [2], ideally suited for astrometric observations, which are an important basis for accurate orbit models. These are usually carried out from distances as far as 5,000 km [3-5] in the case of Phobos. Deimos, moving far beyond the MEX orbit, is observed from distances of 11,000 km to 9,000 km. During closer flybys the SRC covers local areas on Phobos' rugged surface that contribute to the control point network [6]. The HRSC on the other hand is a multiple-line scanner that obtains images in different color bands and under different viewing angles during a flyby[1]. Data from the different viewing angles are suitable for topographic modeling using stereo-photogrammetric techniques [7]. We derived local DTMs from images of 18 flybys obtained from distances ranging between 880 km to as close as 92 km to the surface, from which a global digital terrain model (DTM) was derived [6, 8]. The global DTM and the spherical harmonic shape model are used to determine bulk properties of Phobos, model Phobos' rotation, serve as input for gravity field models [9-11], and to derive cartographic products. For the latter, HRSC images from above mentioned 18 flybys were orthorectified and mosaicked to compile a global map [12, 13]. To date mostly monochromatic image data were processed whereas RGB and IR images exist that are to be processed in near future. In spring 2016, all derived Phobos products were submitted to PSA including control point coordinates, digital terrain models, orthorectified images, and image mosaics. The submitted data can be downloaded through [14].

Outlook. The current MEX mission extension until 2018 provides a number of close flyby opportunities to complete Phobos' surface coverage in best resolution and to maintain continuity of accurate astrometric observations. The additional data will enable refinements in the rotational parameters [15]. Mutual events (Fig. 1) are currently being analyzed and will provide additional information such as the relative satellite motions.

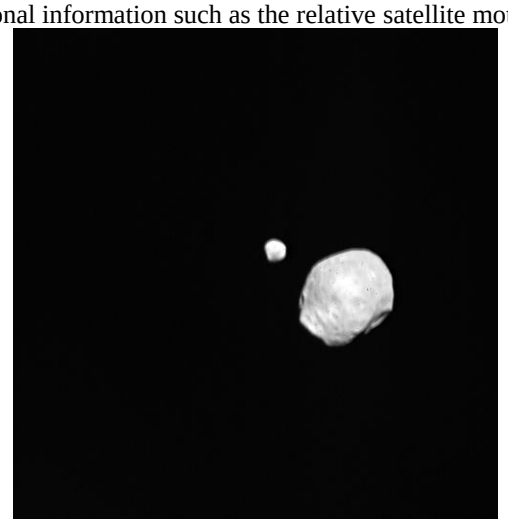

Figure 1: Observation of the Martian moons by the SRC on Mars Express from 11,800 km distance to Phobos and 26,200 km to Deimos .

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Acknowledgment: .

The authors wish to thank the HRSC Experiment Teams at DLR Berlin and Freie Universität Berlin as well as the Mars Express Project Teams at ESTEC and ESOC for their careful planning and successful acquisition of Phobos flyby data as well as for making the processed data available to the HRSC team, without which these results would not have been possible.